I. C. 7422 DECEMBER 1947

UNITED STATES
DEPARTMENT OF THE INTERIOR
J. A. KRUG, SECRETARY

BUREAU OF MINES
JAMES BOYD, DIRECTOR

INFORMATION CIRCULAR

RECEIVED
DEC 31 1947

SOME OBSERVATIONS ON GERMAN COAL RESEARCH AND DEVELOPMENTS

BY

H. H. LOWRY AND H. J. ROSE

Generated on 2024-09-19 18:49 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FOREWORD

This report is one of a series written by members of the Solid Fuels Mission to Germany describing wartime developments in the mining, preparation, and utilization of coal. This mission was organized early in 1945 under the auspices of the Technical Industrial Intelligence Committee, which cooperated with a counterpart British committee. In some instances, engineers from other allied countries cooperated. The Solid Fuels Mission operated under the direction of a steering committee headed by Dr. C. J. Potter, Deputy Solid Fuels Administrator. The personnel of the mission consisted of J. W. Buch, Thomas Fraser, L. L. Newman, L. D. Schmidt, and H. F. Yancey of the Bureau of Mines; H. H. Lowry, Director of the Coal Research Laboratory, Carnegie Institute of Technology; H. J. Rose, Vice-president and Director of Research, Bituminous Coal Research, Inc., and H. F. Reed, Chief Chemist, Illinois Geological Survey.

Over 50 reports were written by the members of the Solid Fuels Mission. These reports, together with microfilms of supporting data obtained in the course of the investigations, are on file at the Bureau of Mines, Washington, D. C., where they are available for public examination. The Office of the Publication Board in the Department of Commerce is prepared to furnish photolith copies, photostats, or microfilm reproductions of all declassified reports. A Bibliography of Scientific and Industrial Reports is issued weekly by the Department of Commerce, Office of the Publication Board, and is sold by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., on a subscription basis. An initial payment of $10 will provide for approximately 9 months, and subscribers will be notified when additional remittance is necessary. All subscriptions will begin with volume 1, No. 1, unless ordered otherwise. The Bibliography covers all materials and subjects and gives instructions for obtaining the desired items.

The reports of the Solid Fuels Mission relate to the following general subjects: viz., Mining methods in the Ruhr district of Germany, with special reference to mechanical cutting and loading equipment, pneumatic packing, and Diesel mine locomotives; activities of industrial research laboratories supported by the German coal and coke industry; coal preparation in Western Europe; low-temperature carbonization processes; metallurgical coke from weakly coking coals; low-ash electrode carbon from coal; new developments in the production of metallurgical coke and the utilization of gas and by-products; briquetting brown coal and bituminous coal without the use of binders; recent engineering developments in gas turbines and steam generators with special reference to use of coal; German coal-fired heating and cooking stoves; and the commercial extraction of coal with solvents for production of synthetic liquid fuels or chemical products.

Numerous reports on the activities of German synthetic liquid fuels plants and the plants for the production of synthesis gas from solid fuels are available in the same office as the solid fuels reports.

Generated on 2024-09-19 18:55 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

It is planned to publish in this series of Bureau of Mines Information Circulars the more important reports or combination of reports prepared by the members of the Solid Fuels Mission. A similar series on synthetic liquid fuel activities is being prepared.

A. C. FIELDNER, Chief
Fuels and Explosives Branch.

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

I. C. 7422,
December 1947.

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

SOME OBSERVATIONS ON GERMAN COAL RESEARCH AND DEVELOPMENTS[1]

By H. H. Lowry[2] and H. J. Rose[3]

CONTENTS

	Page
Introduction	2
Acknowledgment	2
Fuel technology and the Reichsvereinigung Kohle	3
Conclusions	3
Interrogation of Dr. Schwarzkopf	4
Fuel research and technology at Rheinisch-Westfälisches Kohlen Syndikat, Essen	5
Conclusions	5
Support of coal research and technical services	5
The laboratory of R. W. K. S.	6
Fuel research and technology, Bergbau-Verein, Essen-Heisingen	8
Conclusions	8
Organization and work of Bergbau-Verein	8
Department for coal refining and utilization	9
Coal cleaning and petrography	9
Briquetting	10
Coal carbonization	13
Oxidation of coal	14
Coal-oil mixtures	16
Furnace technique and coal gasification	16
Technical mining department	16
The laboratory of the Gesellschaft für Kohlentechnik at Dortmund-Eving	17
Coal and coke research, H. Koppers G.m.b.H., Essen	18
Conclusions	18
Report of visit	18
Fuel research activities, The A. G. der Kohlenwertsoff-Verbande Bochum.	20
Conclusions	20
Structure	20
Synthesis of toluene	20
Pitch coke and electrode carbon	20

1/ The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7422."

2/ Director, Coal Research Laboratory, Carnegie Institute of Technology.
3/ Vice-president and Director of Research, Bituminous Coal Research, Inc.

Generated on 2024-09-19 18:54 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

CONTENTS (Continued)

	Page
Solvent refining of coal tar	21
Weather-resisting road tar (VFT Wetterteer)	21
Sulfuric acid from coal pyrites	22
Filtering Diesel fuel oils	23
Interaction of sulfur compounds and lead tetraethyl	24
Gaseous motor fuels	25
Coal-carbonization research of Carl Otto & Company, G.m.b.H., Dahlhausen, Essen	25
Conclusions	25
Report of visit	26

ILLUSTRATIONS

Fig.		Following page
1.	Front entrance of laboratory of Rheinisch-Westfälisches Kohlen Syndikat	6
2.	Typical condition of individual rooms in laboratory of Rheinisch-Westfalisches Kohlen Syndikat	6
3.	Roll crusher used for preparing coke samples	6
4.	Damaged office of Bergbau-Verein	8
5.	Temporary quarters of Bergbau-Verein	8
6.	Kaiser Wilhelm Institut für Kohlenforschung	8
7.	Gesellschaft fur Kohlentechnik	8
8.	Minister Stein Colliery	16

INTRODUCTION

Considerable information on the organization of German fuel research and recent developments was obtained and published in several combined Intelligence Objectives Sub-Committee Reports. This material, although available in the initial reports, has never been consolidated, so that it may not have come to the attention of many readers. This report gives a summation of the authors' observations at six different research laboratories.

ACKNOWLEDGMENT

The authors wish to acknowledge the assistance of L. L. Newman, Bureau of Mines, in interrogating personnel at the Rheinisch Westfalisches Kohlen-Syndikat, John W. Buch and H. F. Yancey, Bureau of Mines, and E. T. Wilkins, Fuel Research Station, Department of Scientific and Industrial Research, London, for interviewing personnel at the Bergbau-Verein, and to Mr. Buch and Dr. Wilkins for assistance in preparing the initial report on this laboratory. In addition, the authors wish to acknowledge the assistance of Dr. Wilkins in interviewing personnel at the A. G. Der Kohlenwertsoff-Verbande Bochum and preparing the initial report.

Generated on 2024-09-19 18:54 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

FUEL TECHNOLOGY AND THE REICHSVEREINIGUNG KOHLE[4]

Conclusions

The Reichsvereinigung Kohle and the associated (?) organization Reichsstelle für Kohle do not partake directly in technical matters to the same extent as did the Reichskohlenrat, which they superseded in 1939. Dr. H. Schwarzkopf, formerly Secretary of the Reichskohlenrat and now in charge of fuel technology for the Reichsvereinigung Kohle, remains an important source of information on German fuel technology. The original C.I.O.S. report[4] and T.O.M. reel 70 give detailed information on the organization structure, cooperating institutions, and research projects.

The objective of the Reichskohlenrat was to direct German fuel economy, and for this purpose it made use of the professional knowledge of its committees of experts. These committees gathered the knowledge from practice and research that was important in the fields of coal mining, coal utilization, and social politics; they supported practical and scientific investigations and their publication through the personal participation of the individual committee members and through the agency of specially added members at exceptionally well-qualified scientific institutions and research departments of the industry. The results of these cooperative studies and exchanges of information were generally published by the Reichskohlenrat in its Berichte. The committees of experts had no power to command.

At times, working committees on special subjects were formed and dissolved on completion of their assignments, e.g., committees on domestic fuel, industrial heat economy, production of oil from coal, combination steam and power generation, firing techniques, production and application of pulverized coal, drying techniques, etc.

Relations were maintained by correspondence with related international coal-research organizations, especially for the purpose of cooperation in preparing international conferences such as the World Power Conferences in London, Barcelona, Tokyo, Berlin, Stockholm, Washington, and elsewhere and the International Conferences on Bituminous Coal in Pittsburgh.

Besides the problems covered by the publications in the Berichte der Reichskohlenrat, approximately 30 other subjects were also considered.

It is not entirely clear to what extent the responsibilities and activities of the Reichsvereinigung Kohle can be differentiated from those of the Reichsstelle für Kohle, which it is understood jointly superseded the Reichskohlenrat in 1939. The Reichsstelle für Kohle is understood to have been entirely a governmental body with responsibility for allocation of coal. When such allocation was determined, the amount allocated was distributed by

---

4/ Prepared from Combined Intelligence Objectives Subcommittee report "Fuel Technology and the Reichsvereinigung Kohle," H. H. Lowry and H. J. Rose, 1945. (C.I.O.S. No. XXXI-28, Item No. 28; Solid Fuels No. 23.)

Generated on 2024-09-19 18:52 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

action of the Reichsvereinigung Kohle among its constituent syndicates. The latter body was a voluntary union of the syndicates throughout Germany, including brown coal, bituminous coal, and anthracite. Both organizations were "supreme," neither giving nor taking orders from the other - the operation was through a "personal union," as one man headed both organizations (at present, Dr. R. Regul). Present indications are that the active agency is the Reichsvereinigung Kohle.

One of the main divisions of the Reichsvereinigung Kohle is Technology and Economics (Technik und Wirtschaft). The present head is Dr. H. Schwarzkopf, formerly Secretary of the Reichskohlenrat. The members of this division are generally men active in coal economy from the coal mining industry of the various districts and coal syndicates, who have at their command facilities for research and investigation. The duties of the division originate either from working committees or the president of the Reichsvereinigung Kohle. The necessary investigations are carried out in associated laboratories, research organizations or research departments and, where advisable, with participation of the industry. The research and development work is generally financed by those doing the work, and the results, if expedient, are published in the technical press. If the results of the research and development lead to larger-scale work, the introduction of which would be useful in practice, the members of the Reichsvereinigung Kohle can be so directed by the President. The work of the committee members is honorary. For cooperation on special problems, especially prominent technical persons and appropriate organizations were called on.

Interrogation of Dr. Schwarzkopf

Dr. Reerink of the Bergbau-Verein was stated to be the best source of information on coal carbonization.

On combustion, Dr. Schulte, formerly director of the Verein für Überwachung der Kraftwirtschaft zur Ruhrzechen, and now of the Technischer Überwachungs-Verein, Essen, was cited as the best-informed authority.

Dr. Scheer, of the Bergbau-Verein, was referred to as the best-informed authority on developments in synthesis gasification.

For information on developments in low-temperature carbonization of bituminous coal, Dr. F. Müller of F. Krupp was recommended. It was stated that the biggest developments in this field were in Brux, Upper Silesia, and that Dr. Damm would be the person to see.

New developments in briquetting could be learned best from Dr. Meyer of the Bergbau-Verein. Pressures of many thousands of atmospheres had been used on a research scale for briquetting bituminous coals without a binder; the excessive wear on the machinery made the process impractical and not commercially attractive. The unreacted part from the liquid-phase hydrogenation of pitch had been used as binder for briquets. It was stated that improved 60-gram and larger briquets could be made from brown coal without binder in any briquetting press, such as the Krupp roll press, by fine grinding and

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

drying to zero moisture; the briquets are stable to weather and abrasion and suitable for gas generation. This method of briquetting is in use at the Rodder Grube near Liblar, near Cologne.

The constitution of coal was no longer studied by organizations such as the Kaiser Wilhelm Institut der Kohlenforschung, but only by companies such as the I. G. Farbenindustrie.

On personalities, he reported that Dr. Agde was dead and Dr. Bunte of Karlsruhe was very ill. (Actually he died sometime between November 1944 and January 1945, according to other reposts.) Dr. Harold Kemmer, formerly of the Berlin Gaswerke, is now director of the Posen Gaswerke.

FUEL RESEARCH AND TECHNOLOGY AT RHEINISCH-WESTFÄLISCHES KOHLEN SYNDIKAT, ESSEN[5/]

Conclusions

The Rheinisch-Westfalisches Kohlen-Syndikat is a sales agency for Ruhr, Aachen, and Saar coals and employs engineers for service to its customers and chemists for service to the mines. It is well-equipped for these services. The organization structure, activities, and staff are given in the C.I.O.S. report.[5/]

During the war, R.W.K.S. was given the responsibility of approving solid-fuel-burning equipment for house heating and small commercial uses. This responsibility required cooperation with equipment manufacturers to assist in recommending changes in design to meet acceptable standards of efficiency and in selection of fuel.

Support of coal-research and technical services. - There are about 40 member companies supporting R.W.K.S. in the Ruhr and not over 60 in all. Their sales were reported to be as follows for the fiscal years beginning April 1 and ending March 31:

	Tons
1939-40	144,000,000
1942-43	153,000,000
1943-44	145,000,000
1944-45	100,000,000 (est.)

The Syndikat receives 7 to 9 pfg. per ton sold (exclusive of coal used at the mines), depending on the actual cost of R.W.K.S. activities from time to time. Of the total income received before the war, stated to be about 1,200,000 M per month, about 10 percent was spent on laboratory work. The percentage of "present" income of 750,000 M per month spent on the laboratory

[7] Prepared from Combined Intelligence Objectives Subcommittee report "Fuel Research and Technology at Rheinisch-Westfälisches Kohlen-Syndikat, Essen," H. H. Lowry and H. J. Rose, 1945. (C.I.O.S. No. XXXI-24, Item No. 30; Solid Fuels No. 16).

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

work was not certain; the laboratory does not operate on a fixed budget, but special appropriations are made as occasion requires.

The laboratory of R.W.K.S. - The laboratory (fig. 1), which is at Syndikatstrasse 3, Essen, was completed in 1936. The main building is of four stories, each of which contained 15 to 20 rooms or laboratories. It is estimated that bomb damage (fig. 2) destroyed 60 percent of the structure and only the ground floor, which housed the heat-technology department, the sample-preparation room, and laboratories for physical testing of coal and coke, was in use at the time of inspection. Constructional details, floor plans, and photographs of some of the laboratories have been published in tw articles.6/7/

In the laboratories for physical testing of coke and coal, most of the equipment was standard. The Micum drum test for coke is accepted as standar although provision was made to use the ASTM shatter test and the Wolff pressure test. Neither of these tests has wide acceptance in Germany. The Nedelmann drum test was used for determining strength of small experimental samples of coke. A new test was being investigated for determining hardness of coals. The equipment was a sheet-steel cylinder about 20 centimeters in diameter and 50 centimeters long, which was charged from one end and then closed. The cylinder was supported midway by a trunion, and was rotated 18 degrees through a hand-operated gear drive at a speed characteristic of the individual making the test. Fifty such "up-endings" were made, allowing a certain fall of the sample and screen analysis of the product made. The results were reproducible if a single operator was used, and showed a decrease in hardness or strength of coals from anthracite to low-volatile (mager) coal to steam coals. It was recognized that further development was required to standardize conditions of test.

In the sample-preparation laboratory, a special roll crusher (fig. 3) w in use for preparation of coke samples for analysis, which could reduce 200 grams of coke, after being passed through a jaw crusher, to minus 60 mesh in 5 to 10 minutes. The roll and plate were manganese steel; the roll, weighing about 500 pounds, was moved forward and backward over the sample spread on th plate by a reciprocating drive. An illustration of the crusher is contained in reference 7.

An experimental coke oven of 150 kilograms capacity, with silica walls heated by gas, was available for studying the effect on coke quality of blending noncoking coals with Ruhr coals. The oven was 30 centimeters wide and about 1 meter long and 1 meter high. Top charging by hand was employed. The coke was pushed by machine into a water-cooled metal container, thus

6/ Weidemann, Dr. F., Das feueringstechnische Laboratorium des Rheinische-Westfälischen Kohlen-Syndikats in Essen: Heizung and Lüftung; 1936, Heft 5, pp. 79-83.

7/ Radmacher, Dr., Das neue Chemische Laboratorium des Rheinisch-Westfälisch Kohlen-Syndikats in Essen: Die Chemische Fabrik, 1938, Heft 1/2, pp. 20-27.

Generated on 2024-09-19 18:55 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

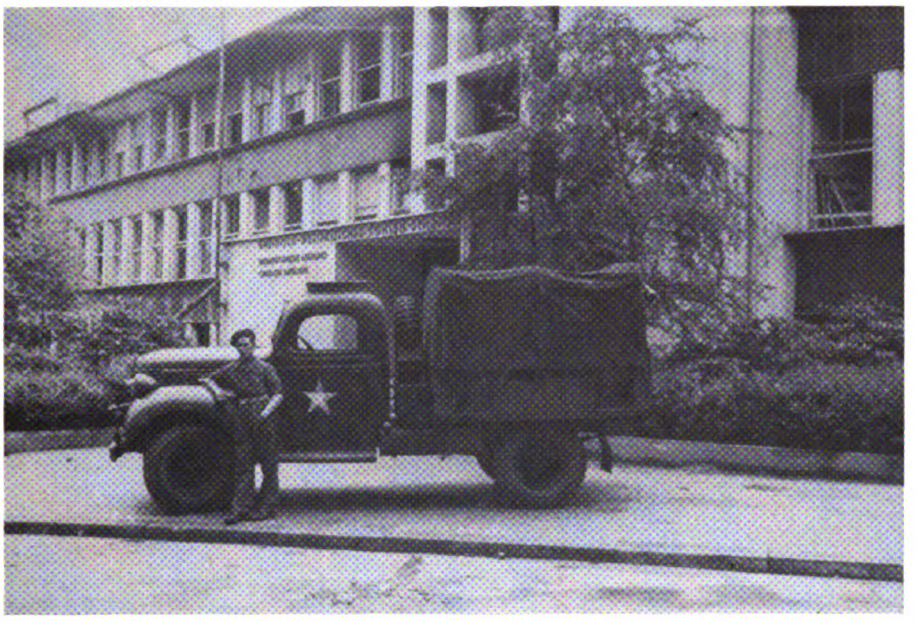

Figure 1. - Front entrance of laboratory of Rheinisch-Westfälisches Kohlen Syndikat at Syndikatstrasse 3, Essen, Germany. (Photo by H. J. Rose.)

Figure 2. - Typical condition of individual rooms in laboratory of Rheinisch-Westfälisches Kohlen Syndikat at Syndikatstrasse 3, Essen, Germany. (Photo by H. J. Rose.)

Generated on 2024-09-19 18:53 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

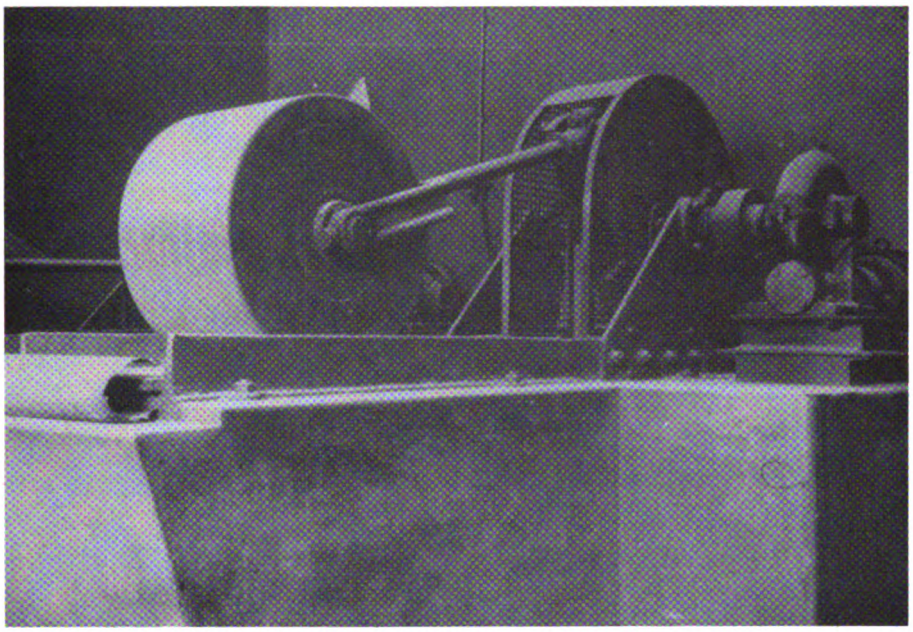

Figure 3. - Roll crusher used for preparing coke samples, laboratory of Rheinisch-Westfälisches Kohlen Syndikat, Syndikatstrasse 3, Essen, Germany. (Photo by H. J. Rose.)

Figure 4. - Damaged office of Bergbau-Verein, Friedrich-strasse 2 (left), Essen, Germany. (Photo by H. J. Rose.)

Generated on 2024-09-19 18:57 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

avoiding quenching with water. Temperatures in the coke were measured by thermocouples and in the flues by optical pyrometers. With a flue temperature of 1,150° to 1,200° C., coking time was 24 hours. This was admitted to be too slow a rate for direct comparison with plant practice, but it was claimed that experience had provided the necessary conversion factors. The equipment had not been used for carbonization of dry or preheated coal. Byproducts were not collected. The equipment in general is much inferior to that built for similar studies elsewhere.8/

Pressures developed during carbonization of coal were measured by a gage designed by F. Ulrich. Experimental work with various coals in the small oven described in the preceding paragraph led to modification in design and full-scale tests at the Helene Steinkohlenbergwerk coke ovens of F. Krupp. The design is described and results of tests are outlined in a published paper.9/ The gage is massive, water-cooled, with the pressure exerted against a small diaphragm transmitted by glycerine to an indicating dial. Temperatures of the steel shell are measured by a thermocouple, and the gage must be withdrawn when the steel temperature reaches about 600° C. The gage seen at the R.W.K.S. laboratory was somewhat oval in cross section, about 3 inches in maximum and 2-1/4 inches in minimum diameters, and about 4 feet long. It required two men to carry it. Although discussion of the gage with other German fuel technologists indicated that the instrument was impractical owing to its obvious physical limitations, at R.W.K.S. it was stated that industrial interest in the gage was such that an instrument maker, Dreyer-Rosenkranz & Droop, in Hannover, had redesigned the gage for production, but had built only two or three before bomb damage made further work impossible.

Dutch-tile ovens (Kachelofen) for house heating received considerable attention during the war. Their construction was such as to require the minimum of steel. R.W.K.S. was especially concerned in its efficiency of fuel utilization in proposed designs and had the authority to stop the manufacture of those that did not meet standards of efficiency. Tests were made of rate of fuel consumption and flue-gas composition and temperature, but no direct observation was made of smoke density. An apparatus was available for recording Ringelmann smoke numbers. Heat absorption in the equipment was stated to be as high as 95 percent,10/ and at least 70 percent was required of wartime stoves. The methods of tests and typical results were described in publications.10/,11/

8/ Reed, Frank H., Jackman, Harold W., and Henline, P. W., Coke from Illinois Coals: Ind. Eng. Chem., vol. 37, June 1945, pp. 560-566.

9/ Ulrich, F., Bestimmung des Treibdrucks einer Kohle in der Ofenkammer: Gluckauf, Heft 6, 1939, pp. 128-133.

10/ Wiedemann, F., and Schaeffer, H., Steinkohlen in Kachelgrundofen: Das Kachelofen, Heft 12, 1942, pp. 1-8.

11/ Schaeffer, H., Steinkohlen in Kachelgrundofen: Das Kachelofen, Heft 5/6, 1940, pp. 17-23.

Generated on 2024-09-19 18:58 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Studies were made also on conversion to other solid fuels of domestic heating appliances designed for anthracite.[12]

Beginning even before the war, a shortage of the smaller sizes of coal which in earlier years had been surplus, led to studies of crushing larger sizes of coal with production of a minimum of fines.[13], [14], [15]

The R.W.K.S. laboratory would appear to have been well on the way to becoming one of the most important centers of coal research in Germany, particularly with its association with the Verein für die Bergbaulichen Interessen (Bergbau-Verein). Wiedemann stated that the Bergbau-Verein had only research problems for future developments, whereas all problems originating with current coal consumers were handled by R.W.K.S. This was not concurred in by Bergassessor Wüster of the Bergbau-Verein. Although covered in separate reports, it may be stated that the Bergbau-Verein had absorbed the Gesellschaft für Kohlentechnik. It was stated that cooperation was not at the organization level, but at personal levels. However, it may be mentioned that the experimental work of Dr. W. Lange of the Gesellschaft für Kohlentechnik on production of organic acids by oxidation of coal were carried out in the laboratory of R.W.K.S.

FUEL RESEARCH AND TECHNOLOGY, BERGBAU-VEREIN, ESSEN-HEISINGEN[16]

Conclusions

The Bergbau-Verein and its group at the Gesellschaft für Kohlentechnik form an important center of coal research. Its connections throughout the coal industry make it a most important source of information on developments in coal research and technology. Bergassessor Wüster is very cooperative, speaks English well, and helped materially in arranging interviews with fuel technologists of industrial and other organizations. Temporary quarters were used after heavy bombings (figs. 4 and 5.)

Organization and work of Bergbau-Verein (including Gesellschaft für Kohlentechnik). - In the various lists of targets, the Bergbau-Verein and the Gesellschaft für Kohlentechnik are shown separately. However, the Bergbau-Verein acquired all the equity in the Gesellschaft für Kohlentechnik

---

12/ Wiedemann, F., Über die Umstellung häuslicher Anthrazit-Feuerstätten auf andere Brennstoffe: Heizung und Lüftung, Heft 10, 1940, pp. 358-362.

13/ Wiedemann, F., "Die Verlagerung im Sortenproblem des Steinkohlenbergbaus," Archiv fur Warmewirtschaft und Dampfkesselwesen, Heft 5, 1938, pp. 113-116.

14/ Wiedemann, F., and Lenhart, K., Über die Verbreiterung der Brennstoffgrundlage bei der Planung von Dampfkesselanlagen: Die Wärme, Heft 1, 1940, pp. 1-6.

15/ Lenhart, K., Untersuchungen über die Vorzerkeinerung grober Steinkohlensorten für Dampfkesselfeuerungen: Elektrizitätswirtschaft, Heft 11, 1941, pp. 186-193.

16/ Prepared from Combined Intelligence Objectives Subcommittee report "Fuel Research and Technology, Bergbau-Verein, Essen-Heisingen," by H. H. Lowry and H. J. Rose, 1945. (C.I.O.S. No. XXXI-25, Item No. 30, Sc. Fuels No. 22).

Generated on 2024-09-19 18:53 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

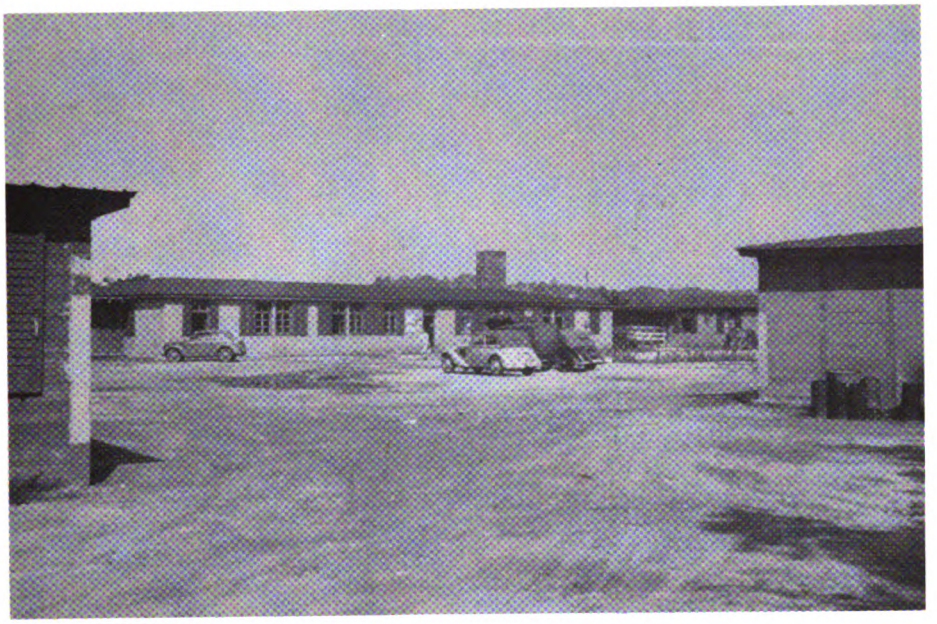

Figure 5. - Temporary quarters of Bergbau-Verein at Essen-Heisingen, Germany. (Photo by H. J. Rose.)

Figure 6. - Kaiser Wilhelm Institut für Kohlenforschung, Kaiser Wilhelm Platz 1, Mülheim, Ruhr, Germany. (Photo by H. J. Rose.)

Generated on 2024-09-19 18:49 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

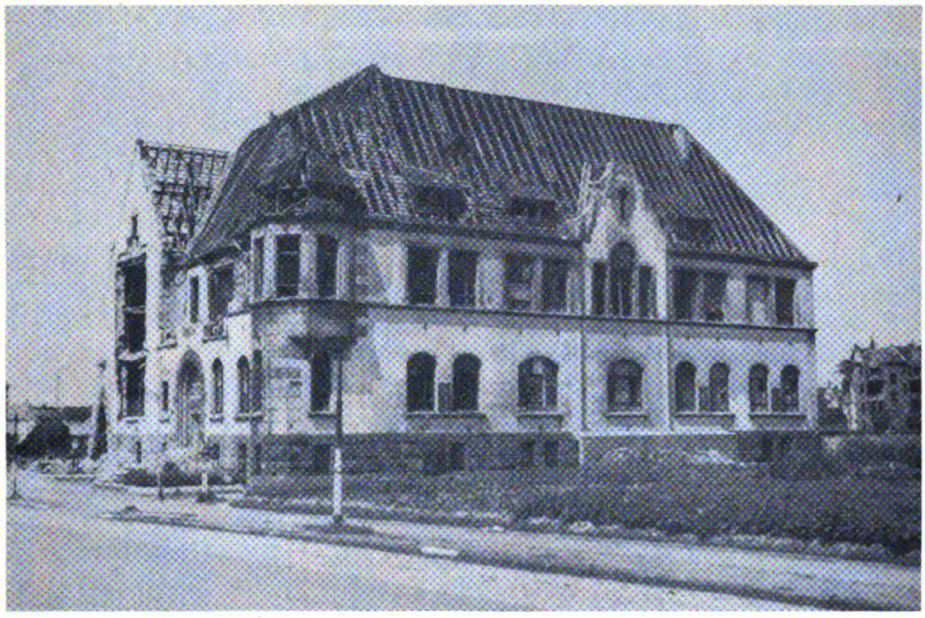

Figure 7. - Gesellschaft für Kohlentechnik, Dortmund-Eving, Germany. (Photo by H. J. Rose.)

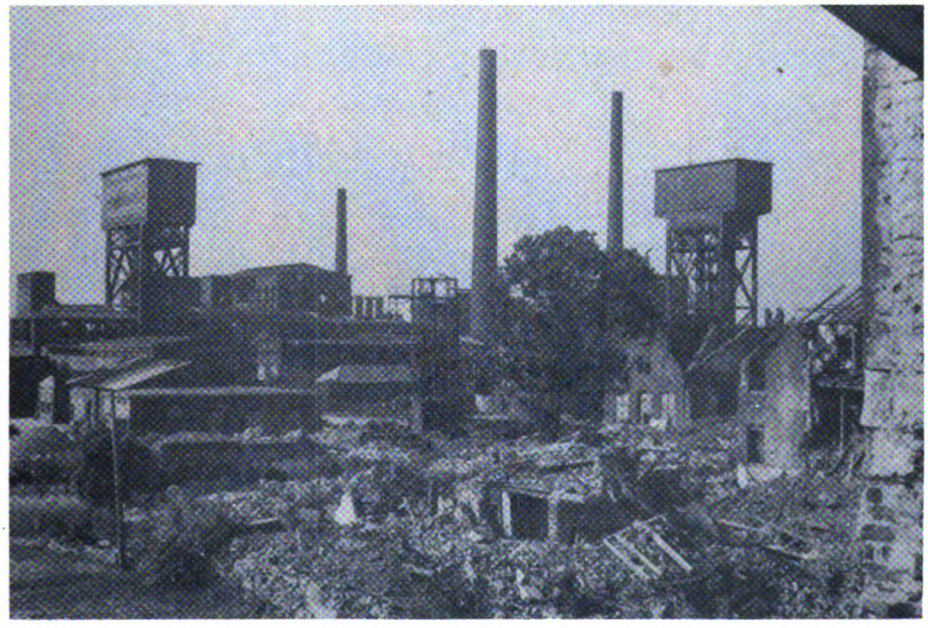

Figure 8. - Minister Stein colliery as seen from library of Gesellschaft für Kohlentechnik, Dortmund-Eving, Germany. The extensive library and records of the research laboratory were said to have been evacuated to a mine in this colliery. (Photo by H. J. Rose.)

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

on January 1, 1941, and it is not feasible to discuss the activities separately. The following report is based upon notes made from outlines prepared by Wuster for Lt. Col. Starr, British SHAEF G-4 Solid Fuels RCD 4, Essen-Heisingen, and on notes taken during interrogation of personnel.

The Bergbau-Verein receives its support from the mines in the Ruhr in the form of a royalty of four pfennigs per ton of production. From 30 to 35 percent of the income is spent on research (from the mines' point of view) on practical objectives. Long-range fundamental research, from the purely scientific viewpoint, is carried out at the Kaiser-Wilhelm Institut für Kohlenforschung (fig. 6), whereas the Rheinisch-Westfälisches Kohlen-Syndikat does research for customers only. The research work previously done by the Verein für Uberwachung der Warmewirtschaft zur Ruhrzechen on combustion and carbonization is now carried out by the Bergbau-Verein and R.W.K.S., whereas responsibility for inspection, safety, and boiler acceptance tests, formerly held by the Verein für Uberwachung, has been extended from the coal industry to all industry under the Technischen Uberwachungs-Verein, Essen. The Westfalische Berggewerkschaftkasse in Bochum had been active in chemical and physical coal research. Dr. F. K. L. Kuhlwein is at present working for Bergbau-Verein; Dr. P. Kukuk, well-known geologist of the Ruhr, does require chemical assistance, which is furnished by the chemical laboratory of the Berggewerkschaftkasse, which otherwise does little research. Studies have been made by Drs. Reerink and Grosskinsky and their associates of the Bergbau-Verein with the object of planning a combined research institute for coal utilization and coal refining, which would provide facilities for experimentation on both laboratory and experimental-plant scale.

Department for coal refining and utilization. - This department at Dortmund-Eving (fig. 7), is headed by Dr. Ing. W. Reerink, and the planning is done jointly with Dr. Grosskinsky, chief chemist and manager of the Gesellschaft für Kohlentechnik, with the assistance of committees on Raw Coal Research, Briquetting, Coal Preparation, Thermal Refining, Chemical Refining, and Coal Utilization.

Coal cleaning and petrography. - Dr. Kuhlwein is in charge of work on coal cleaning and petrography. This work was carried out at Bochum until bombing necessitated its withdrawal to the Clausthal Mining School. The team includes five qualified assistants - Drs. Krupe, Abramski, Riener, Makowsky, and Nötzold - and six other assistants. Their work has been mainly concerned with the following programs:

1. Development of processes for producing very clean coal for carbon electrodes, etc. The principle of dense-medium separation followed by froth flotation, as used at Zeche Koenigin Elisabeth (Mannesmannrohren-Werke A.G.) in Essen-Frillendorf, is patented in Dr. Kuhlwein's name.

2. Dry-cleaning of fine coal by electrostatic methods, which was being studied on a small scale at Clausthal, on an intermediate scale at Zeche Osterfeld (Gutehoffnungshutte A. G.: Oberhausen), and on a commercial scale at Zeche Koenigin Elisabeth. Drs. Schnitzler and Stieler of Metallgesellschaft

Generated on 2024-09-19 18:57 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

A. G., Frankfurt-Main, have also been in Clausthal working on more general applications of the process.

The electrostatic process is at present only capable of treating coking coals, but recent work had shown that coals of both higher and lower rank are more amenable if oxidized at 110° C.

3. Recovery of coal pyrites from washery refuse. Ten plants, consisting either of standard jigs or of high-speed pulsator jigs, had been installed in the Ruhr, where the maximum output of pyrites from this source was 12,000 tons in 1943. About 50 percent of the pyrites present was recovered as a product that met the specification: Sulfur, 42 percent; carbon, 6 percent; moisture, 4 percent. The process cost was 15 to 20 marks per ton.

4. Coal survey and seam registry. It was not possible to make much progress during the war, although the information would have been very useful. The methods involve the use of physical-petrographic techniques as well as chemical procedures. Cooperation is maintained with the laboratories of the Westfälische Berggewerkschaftskasse and the R.W.K.S.

5. Improvement of coking coal. There has been no recent progress with this program, which involves mainly the separation of the petrographic constituents.

Dr. Meyer is in charge of large-scale tests of new coal-preparation techniques, including the following colliery projects for producing very clean coal:

1. Carl Alexander (Gewerkschaft Carl Alexander) at Baesweiler near Aachen. Froth flotation followed by treatment with acids.

2. Koenigin Elisabeth (Mannesmannröhren-Werke A. G.) at Essen-Frillendorf. Heavy-medium separation, froth flotation, electrostatic cleaning.

3. Auguste-Victoria (I. G. Farbenindustrie) at Hüls. Froth flotation.

4. Beuthen Ober-Schlesien. Acid treatment.

Projects 1 and 2 were actually operated; 3 and 4 were not completed.

Briquetting. - Work on coal briquetting is under the supervision of Dr. Meyer, who has associated with him Dipl. Ing. Müller, and is done largel at the laboratories and plants of the collieries and equipment manufacturers There are several objectives, such as improvement of the quality of the briquets, standardization of test methods and briquetting presses, and improvement, hygienically, of working conditions. A problem of immediate concern is the matter of supply of suitable binders.

They have investigated briquetting dry 0.1 mm. bituminous coal at 80° C without a binder at pressures up to about 5,000 atmospheres in laboratory

Generated on 2024-09-19 18:56 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

tests. They are of the opinion that this process is justified only for production of small briquets for subsequent carbonization at low temperatures, to be used as fuel in automobile gas-generators. Conventional briquets made with pitch binder after carbonization are not as dense, hard, and suitable for this particular application. It was claimed that the cost of briquetting without binder was about the same (3.5 to 4 marks/ton) as when using the usual 6 to 8 percent pitch at conventional pressures. Briquetting has been done at intermediate pressures with 2 to 3 percent sulfite liquor binder (dry basis) and then carbonized at 600° C. with good results.

Dr. Kuhlwein claimed that coals of about 13 percent volatile matter were best for briquetting without binder at high pressures. For making a briquet without binder, which is to be carbonized, it is very important to use the right mixture of coking (e.g. 50 to 70 percent) and noncoking coals to give hard, nonswelling briquets.

They said that Gutehoffnungshütte at Zeche Osterfeld in Osterfeld, north of Oberhausen (Ruhr), had an experimental briquetting plant employing the Ten Bosch process without a binder on coal ground to 4,900 mesh per square centimeter (about 175 mesh per linear inch) at 2,000 to 3,000 atmospheres pressure. The G. H. H. had constructed a large unit for this process but it had been damaged by bombs and had been returned some months ago to the G. H. H. shops at Dusseldorf for repairs. It was intended for the production of briquets for automobile gas-generators.[17]

Kuhlwein and Meyer referred to two types of Ringwalzenpresse. One is the original Apfelbeck press with a single groove for the coal being briquetted. The other type has two grooves and about twice the capacity. It has been developed cooperatively by Fried. Kruppgrusonwerke A. G., Magdeburg-Buckau; Lurgi of Frankfurt; and Herglotz Company of Falkenau near Carlsbad. It has been used without binder for brown coal at 1,500 to 2,000 atmospheres and with only 2 to 3 percent-pitch binder for bituminous coal.

A description of the Apfelbeck press and process has been published.[18]

In the following table, obtained from Dr. Kuhlwein, the figures for the Apfelbeck process are from this paper by Holik, whereas the figures for the Ten Bosch process were supplied by Bergbau-Verein.

17/ Yancey, H. F., Hendricks, T. A., and Schmidt, L. D., Briquetting Bituminous Coal Without Binder at the Gutehoffnungshütte, Osterfeld, Ruhr: (Available from Office of Technical Services, Dept. of Commerce).

18/ Holick, J., Die bindenmittelfreie, Brikettierung nach Apfelbeck: Gluckauf, 1934, vol. 70, pp. 385-93.

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

TABLE 1. - Comparison of coal and briquets by different methods of briquetting without binder

Kind of press	Apfelbach ring roll	Ten Bosch
Experimental coal	Rtanj	Alter Hellweg
Kind of coal	Fettkohle	Esskohle
Analysis of the prepared coal		
	Percent	Percent
Water	6.6	1.3
Volatile matter	23.2	14.5
Ash	13.8	10.2
Net calorific value		7419
Grain size, in mm.	About 3-0	Below 0.2 (10% ov 178 mesh per line inch)
Coking properties of the coal	Good, coke swollen and coked.	Noncoking
Working information on the presses		
Pressure duration, seconds	About 1	0.8
Briquetting pressure, atmospheres	1500-1600	4,500
Briquetting temperature of the coal, °C.	80-100	80-85
Specific power employed, kwh/t	7.5	About 35
Press output, tons per hour	5	2
Strength characteristics of the briquets		
Lever press strength, kg/cm^2	About 110	250
Bending strength, kg/cm^2	14-18	?
Compressive strength, kg/cm^2	?	40-50
Tensile strength, kg/cm^2	Up to 4	50-60
Trommel strength, percent	88-94	77
Water taken up after 4-1/2 months storage in the open during winter, percent	0.35 to 0.69	
Combustion behavior		
Ignition	Very rapid	Very rapid
Soot and smoke formation	None	None
Disintegration at high temperature	No	No
Degree of burning out	Good (3% unburned fuel	Burn out clean (0.8% unburned
Clinker formation	None	None
Heating efficiency - useful heat as percent of heat in fuel	High	71.25

Generated on 2024-09-19 18:53 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Coal carbonization. - Dr. Reerink is one of the outstanding authorities n coal carbonization, having for some years been associated with the Verein ür Überwachung der Wärmewirtschaft zur Ruhrzechen and having collaborated ith Drs. Kurt Baum, W. Litterscheidt, and Steinschlager. The work on this ubject for the Bergbau-Verein, under Dr. Reerink, is headed by Dr. Scheer, ho has associated with him Dr. Lameck and Obering.Sassonhoff. The experi- ental work has as objectives standardization of coke oven plants, thermal fficiency of operation, development and examination of new processes, broad- ing the classes of coal that can be coked, quality of blast-furnace and oundry coke, and recovery of byproducts.

There is still no agreement on what is good coke. Many laboratory tests ere developed in the period when there was an excess in the supply of coke, ut as the demand for coke increased, investigations of new methods of char- cterization of coke decreased, and a wide range of physical properties was ccepted as between different districts. Specifications of coke no longer ncluded special physical tests, and even standard tests such as the Micum est were not emphasized; requirements generally included only percentages f ash, sulfur, and phosphorous. A few laboratories used the Wolff pressure est and virtually none the ASTM shatter test for determining coke strength. n investigation of the qualities desirable in foundry coke was planned at he beginning of the war; but it was only started in 1944 and was soon dis- ontinued because of lack of facilities. The main problem for foundry coke as to learn how to make coke in the more modern narrower ovens similar in uality to that made in the older wide ovens. The coke made in the narrow vens required higher pressures in operation of the cupola than normally vailable. The Verein der Deutsche Eisenhüttenleute (Dr. Rummel) had in ecent years discontinued their research on coke quality. Coking tests were onsidered to give only qualitative information on the quality of coke made rom blends of coals, and quantitative correlation with strength of coke roduced commercially was not possible; use of such tests declined during he war.

In Dr. Reerink's opinion, ovens 4 to 4.5 meters high and 450 millimeters ide were best for Ruhr coals. Ovens 6 meters high could be justified only here ground space is limited and additional capacity is needed. Such ovens ere built by Still at Nordstern (Gelsenkirchener Bergwerks A. G.) and could e uniformly heated and operated without mechanical difficulties, contrary o other reports. In the past 10 years, however, emphasis had been on by- roduct recovery rather than oven construction. The Still process was re- arded to have value only with the right combination of coal, oven tempera- ure, and other operating conditions; it had been tried in three or five lants in the Ruhr, but was discarded; only one plant in the Saar, Röchling, as known to be using the Still process, and thereby obtained an increase of 0 to 30 percent in light oil. The light oil is high in paraffins and not uitable for nitration but only for motor fuel.

The Gesellschaft für Kohlentechnik has continued its studies of by- roduct recovery and utilization under Drs. Grosskinsky, Klempt, Umbach, eller, and Adelsberger. A method of recovery of thiocyanate developed by hem has been installed at Zeche Graf Moltke (Gelsenkirchener Bergwerks A.G.)

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

in Gladbeck. Other studies include methods of recovery of byproduct ammonia and its tranformation to fertilizer without the use of sulfuric acid, recovery and utilization of hydrogen sulfide from coke-oven gas and ammonia liquor, and recovery and utilization of hydrocyanic acid. Production of synthetic resins from both phenol and urea is also being studied. The Berichte der Gesellschaft für Kohlentechnik was published irregularly during the war, the last volume, V, being issued in three parts in September 1939, May 1940, and January 1942. Dr. Reerink recommended the following list of publications as worthy of study for learning about recent developments in coal carbonization in Germany:

Die Olausbeute bie der Verkokung, by W. Reerink. Glückauf, 1942, vol. 78, pp. 597-602.

Erfahrungen bie der Verkokung und Schwelung von Saar und Lothringischer Kohle, by W. Gollmer. Stahl und Eisen, 1942, vol. 62, Heft 38, pp. 789-795.

Die Warmetechnische Beurteilung Neuzeitlicher Koksofen, by W. Litterscheidt. Archiv für bergbauliche Forschung, November 1941, pp. 101-124.

Die Bedeutung der Trockenen Kokskühlung für den Kokereibetrieb, by W. Scheer. Stahl und Eisen, 1944, vol. 64, Heft 4, pp. 53-62.

Das Treiben der Steinkohlen bie der Verkokung, by K. Gieseler. Glückauf, 1941, vol. 77, pp. 309-319, 328-332.

Die Methoden zur Bestimmung der Kohlenwertstoffausbeuten bie der Verschwelung und Verkokung der Steinkohle, by P. Hoffman, Feuerungstechnik, 1941, Heft 9, pp. 205-209.

Die Methoden zur Bestimmung der Bildsamkeit von Steinkohlen, by P. Hoffman. Feuerungstechnik, 1942, Heft 11, pp. 249-255.

Fortschritte und Erkenntnisse in der Verarbeitung des Destillationsgases der Kokereien, by W. Gras. Glückauf, 1942, vol. 78, pp. 57-61, 73-76.

Gasschwefelgewinnung nach dem Ammoniakverfahren auf der Kokerei Reden, by H. Lohrmann and P. Stöller. Archiv für bergbauliche Forschung, July 1942, pp. 43-48.

Oxidation of Coal. - Since 1942, considerable work has been done on production of materials of interest to the chemical industry by controlled oxidation of coal. This work is directly under Dr. Grosskinsky's supervision with assistance of Dr. Klempt, Dr. Lange, and Dipl. Chem. Jüttner (B. Jeuttner, Coal Research Laboratory, Carnegie Institute of Technology 1930-1939.) Coal is first oxidized with air or oxygen until the caking power is destroyed, the reaction being carried out slowly at the start to

Generated on 2024-09-19 18:55 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

prevent ignition. Steam in amounts of 10 to 50 percent is added to the gas stream for controlling the reaction rate. With oxygen, the maximum temperature used is 220° C., and with air, 300° C. The time of reaction depends on the coal used, a typical result being 30 hours at 250° in air for coal sized between 10 and 20 millimeters, or 15 hours at 250° in air for 1 to 2 millimeter coal. The product can be activated to give an active carbon, which may be reacted with sulfur to produce carbon disulfide, or it may be carbonized at low temperatures to yield an active raw material for gas manufacture, or it can be treated with chemical reagents to yield organic acids. The latter studies were carried out at the R.W.K.S. laboratories in Essen by Dr. Lange, whereas studies of utilization of the acids produced were carried out in Dortmund-Eving by Mr. Jüttner. Patent applications have been made since 1942 on these processes.

Several different chemical oxidizing agents were studied; but most work was done on a preferred process with oxygen and nitric acid. With chlorine and oxidized coal at 100° C., the reaction required 1 week and yielded 30 percent organic acids - work discontinued. About the same yield was obtained with alkaline permanganate, but separation of the acids was difficult and too expensive. It was reported that oxygen and aqueous alkali at 420° to 450° C. and 300 atmospheres total pressure gave a yield of 60 grams of acids per 100 grams of oxidized coal in 3 hours; the aqueous alkali was of 10 to 30 percent concentration of sodium or potassium hydroxide, lime being unsatisfactory; work was discontinued because of cost of equipment and difficulty with filtering, recovery of free acids, and regeneration of alkali. Other reagents were tried but showed no promise.

The nitric-acid oxidation was made with nitric acid of 1.2 specific gravity, with recirculation of the oxides of nitrogen evolved plus added oxygen to regenerate the nitric acid. At normal atmospheric pressure and a reaction temperature of 110°, the time of reaction was 2 days, and at 5 atmospheres and 140° this time could be cut in half. The reaction is carried out in glass, enamel-lined, or V-2A steel (18-8 alloy) equipment. It was claimed that 1 part of coal to 10 parts of acid could be used in a continuous process, regenerating the acid with a loss of only 1 percent and adding fresh coal with removal of crystals of the acids from the reaction vessel continuously. Equipment was built to produce 5 kilograms of acid per day but only operated 8 days before bombing forced its discontinuance in March 1944.

From 100 grams of oxidized coal, 100 grams of acids and 100 grams of other products were obtained. The acids, containing about 50 percent by weight of the carbon of the original coal, were reported to consist principally (80 percent) of mellitic and pyromellitic acids containing a trace of picric acid. The acids were considered to be a new raw material of promise for the resin and lacquer industries; when esterified, as plasticizers for synthetic (Buna) rubber; and when esterified and transformed to ethers, as lubricants or additives to lubricants. The cost of production of the crude acids was estimated at 0.10 M per kilogram (sic!) which was stated to be equivalent in cost to phthalic acid. Amylesters had been prepared and tested by Continental Gummi in Hannover, who requested an additional 10 kilograms for further tests. Higher esters were said to be difficult to prepare because

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

of cracking. The acid number of the esters was said to range from 1 to 5, purification being achieved by filtering through lime. Work is to be resumed as soon as possible.

Coal-Oil Mixtures. - This work was under direct supervision of Dr. Grosskinsky and had two objectives. The Navy was interested in the "colloidal fuel," but difficulties were experienced in transportation, owing to sedimentation. Fine grinding to give true colloidal suspensions yielded a product too viscous to handle at 30 to 40 percent concentration of coal. It was reported that the work was done on a 10 kilogram per day scale and that a plant of 30 tons per day capacity had been built but not operated, as the facilities were bombed out.

The coal-oil suspensions had also been investigated as a means of preparing low-ash coal for electrode carbon and possibly hydrogenation by using them in a process similar to that proposed by Trent of the United States in about 1917. The work had been carried out on laboratory scale only, but the results were regarded as sufficiently promising so that large-scale work had been planned but not carried out.

Furnace Technique and Coal Gasification. - Several problems on these subjects were reported to be under investigation, supervised by Dr. Gumz of Berlin, although the work was not mentioned in discussions either at the Bergbau-Verein or the Gesellschaft für Kohlentechnik. The problems included development of high-capacity furnaces of smaller and greater sizes, development of steam-driven road vehicles, examination and further development of known gasification processes, development of new gasification processes, e.g. dust gasification as being tested at the Nitrogene Works at Wanne-Eickel, and examination and development of small gas producers.

Technical Mining Department. - The head of the department is Dr. Ing. W. Vogel, who is assisted in planning the work of the department by Dipl. Ing. Rauer and the Committees on Mining Technique, Mining Technical Economy, Mining Supply, and Power Economy. Little of value was gained on interrogating the personnel familiar with and active in underground mining research, as apparently much of the research pertains to improved designs of existing equipment, except for the "oscillating conveyor." This is a face conveyor built in 6-meter sections, each one with separate drive motor 1-1/2 kw. It was stated that vibrations are 800 per minute, that material flows 80 centimeters per second, capacity is 200 tons per hour, there is no loss in capacity on pitches up to 5 degrees and a 30 percent loss on a 12-degree pitch uphill, and that 20 such units were planned for experimental work. A drawing of a section of the oscillating conveyor and a 25-page mimeographed copy (unpublished) of German Mining Developments during the war are contained in Technical Oil Mission microfilm reel No. 63 (original designation No. 34A).

A group of mining problems was reported to be under supervision of Dr. Glebe and Dipl. Ing. Rauer, including ascertainment of the most favorable division of mine fields and of size and location of surface plants, improvements in drilling, shot firing, loading, and driving of headings; standardization of steel supports for main roads; improvements of steel props; and testing and development of new support elements.

Generated on 2024-09-19 18:56 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Under Obering. Cuyler and Bergassessor Dr. Ing. Schluter are investigating coal-mining machinery, including development of existing machines and testing of new machines.

Dr. Ing. Passmann is in charge of work in connection with electrical power economy underground. He also, assisted by Dipl. Ing. Schmitt, and working in collaboration with the wire rope-testing institute in Bochum, the coal and iron research institute in Dortmund, and the machine technical institute of the Mining Academy in Clausthal, and various manufacturers, has charge of standardization of machines by type and by kind, of parts of machines, haulage arrangements, electrical fittings, and other appliances and lubricants.

Advice to the collieries, one of which is shown in figure 8, on power economy is provided by Obering. Presser and Prof. Dr. Koch, who are concerned also with improvements in the use of underground locomotives.

The Laboratory of the Gesellschaft für Kohlentechnik at Dortmund-Eving.- The facilities of the laboratory prior to damage by bombing, as judged from inspection, were excellent for experimental investigation of a wide range of problems. A workshop was available for construction of special equipment, including high-pressure autoclaves for operating up to 3,000 atmospheres. An engineering department was available for designing large-scale equipment from data obtained in the laboratory, such large-scale work being done largely in plants of interested concerns. The library, which had been evacuated to a mine in Minister Stein colliery across the street, was said to have been one of the most complete on fuel technology in Germany. The staff that could normally be accommodated was stated to be 80, of whom about 50 were still available. Work was seen in progress in only two laboratories and was on chlorination of hydrocarbons for production of "invert" soaps. The most serious shortage at present, aside from usable space, was stated to be trained chemists, many of whom had left for the Army and not yet returned.

Dr. Grosskinsky told of work done between 1938 and 1942 on indirect fuel cells using gas. The cells operated at 800 degrees to 1,000 degrees and higher and gave about 1.1 volts on open circuit, which dropped to about 0.8 volt on load. The work was done by Dr. M. Blanke and Dr. J. Karweil, Guttingen, in collaboration with Prof. Emil Bauer of Zurich. Patent applications were filed but allowed to lapse because of impracticability, unavailability of materials of construction, and the expressed feeling that such methods of power generation are not economically feasible for at least 20 years. No technical reports on this work were issued, and all records were still in a mine at Minister Stein colliery.

Generated on 2024-09-19 18:51 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

COAL AND COKE RESEARCH, H. KOPPERS G.m.b.H., ESSEN 19/

Conclusions

The laboratories are largely inactive at present, and according to Dr. Koppers, there was neither personnel nor time to do much research in recent years. An exception was work done both on laboratory and larger scale on gasification of pulverized coal with steam and oxygen. The method was said to offer promise, but all records and data were said to have been removed previously by an officer of the United States Navy.

Report of visit. - A tour through the laboratories, which normally accommodated 25 persons, showed almost no activity nor equipment of interest. Tests to determine whether a coal could be safely carbonized in a coke oven without damage to oven walls from coal expansion were made regularly in the Koppers small-scale test oven as described in Koppers Mitteilungen, Heft 1, 1930. Interpretation of the data obtained in this test was aided by development of a medium and a large-scale test to determine scale factors, but use of these larger pieces of apparatus has been discontinued. It was stated that the pressure gage developed by Dr. F. Ulrich of the Rheinisch-Westfälisches Kohlen Syndikat at Essen was not used nor highly regarded by Koppers, though it may have been investigated by Dr. A. Jenkner, a former associate of Dr. H. Koppers some years previously. The advantage of the Koppers test over those developed by Damm, Nedelmann, Macura, and others was the experienc behind the test that gave assurance that the test data were interpreted according to commercial practice.

Although Koppers is not further interested in coking preheated and drie coal and has not done work similar to that of Didier Werke, as reported by Dr. W. Litterschedit in Glückauf, 1935, p. 173, they do have experience in this field. Koppers built the plants for production of Carbolux in Bruay an Carmeaux in France, which still charge hot dry coal to ovens of 350-millimet width. They also built a plant at Barsinghausen, west of Hannover, with ove 3.7 m. high, 10.9 m. long (chamber length), and 200 to 230 millimeters wide, in which dried coal was originally used and flue temperatures were maintainre at 820 to 850 degrees. The time for carbonization under these conditions wa 17 to 18 hours. More recently, the flue temperatures have been raised to 1,100 to 1,150 degrees and, using undried coal, the time of carbonization wa reduced to about 12 hours. This latter procedure is advantageous, as the co produced is as good and commands the same price as that produced when using lower temperatures and preheated dry coal. It was admitted that the capacit of the coke ovens could be increased by preheating and drying, but their experience would not permit estimation of the percentage increase owing to the different flue temperatures used in the operations described above.

19/ Prepared from Combined Intelligence Objectives Subcommittee report "Coal and Coke Research, H. Koppers G.M.B.H., Essen," by H. H. Lowry and H. J. Rose, 1945. (C.I.O.S. No. XXXI-31, Item No. 30; Solid Fuels No. 28).

Generated on 2024-09-19 18:51 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The highest coke oven which Koppers has built is 4.5 meters, and they do not care to build them higher because (a) the greater packing of coal would increase the danger from expansion during coking and (b) it is hard enough to keep 4.5 meter-high doors tight. He felt that they could heat higher flues evenly with the proper circulating system.

In reply to questions on pulverization of coal for carbonization, sizing of the coal was stated to be of special importance with poor coking coals where stamped charges are used. While the sizing specification requires only that 80 percent pass a 2-millimeter screen, this should give about 50 percent through 1 millimeter, and it is desired that 40 percent be below 0.5 millimeter. If these figures are not obtained, although the 80 percent through 2 millimeter is realized, adjustments are made to the crushing machinery to give the desired size distribution.

Koppers have no new developments in low-temperature carbonization, although they have a plant in Upper Silesia that produces in continuous vertical ovens a coke of 8 percent volatile-matter content from nut coal or briquets of noncoking coal. The oven walls are of ceramic construction, and the flue temperatures range from 900 to 1,000 degrees. Dr. Koppers did not regard highly the Krupp-Lurgi LTC system because of the metal walls. He stated that construction had been started by Brennstoff-Technik at Kleinrosseln near Vorbach in the Saar but that a Puning movable-wall coke-oven installation with metal walls had not been completed. The Berlin test plant of the Puning oven was not regarded as promising by H. Koppers. Other test ovens were built at Altenessen and in Hindenburg, Upper Silesia. Semi-coke was not considered to be economically attractive as a domestic fuel because of the prices allowed by the syndicates: Semi-coke was priced the same as high-temperature coke (22 marks per ton) rather than the same price as anthracite (28 marks per ton).

Desulfurization other than by mechanical cleaning of coal for carbonization had been carried out only on a laboratory scale.

It was stated that physical testing of coke was standardized and had not changed for many years. In general, coke was not bought by specification but from coke plants associated with mines that produced coke of a quality that experience had shown was satisfactory from the standpoint of the end use.

Control of the temperature of the free space above the coal charge in a coke oven was said to be important in determining the yield of maphthalene and the paraffin content of the light oil. H. Koppers have done some work on differential heating for this purpose, but the work was discontinued during the war.

Recently, work that appeared to hold promise was carried out, both on a laboratory scale and on larger scale, on gasification of coal with steam and oxygen. Records of this work and the data were reported to have been taken by an officer of the United States Navy who was thought to have formerly been connected with the Chicago By-Products Co.

Generated on 2024-09-19 18:51 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

With regard to coal dryers, Koppers referred to a new-type dryer manufactured by the Büttner Co. at Urdingen, near Krefeld, as well as a direct-fired dryer of the Haas Co. in Lennep, south of Wuppertal-Barmen.

FUEL-RESEARCH ACTIVITIES, THE A. G. DER KOHLENWERTSOFF-VERBANDE BOCHUM[20/]

Conclusions

The management, as represented at the interview, appeared most cooperative and eager to supply any information desired. Dr. Haver speaks English fluently and should be an excellent source of detailed information regarding specific questions with respect to production, distribution, and sale of all byproducts from the carbonization of coal.

Structure. - The A. G. der Kohlenwertsoff-Verbande is made up of seven companies that controlled the sale of byproducts of coal carbonization in Germany and in the export trade. It is also the largest distributor of petroleum products in Germany, operates two plants of its own for the manufacture of sulfuric acid from pyrites and two plants for making pitch coke, and maintains a central laboratory (now bombed out), which had a staff of about 100, of whom 10 are graduate chemists. Most of the laboratory work is on quality control in connection with sales and is not on coal itself, but on byproducts. The normal staff of A.G.K.V. was about 4,000 persons, of whom 1,200 were in the administration at the Bochum headquarters, the rest comprising the sales force. It was stated that 500 to 600 of the staff were still available, including a large proportion of the laboratory technicians.

Synthesis of toluene. - It was reported that work had been done on the synthesis of toluene from benzene and methyl alcohol over phosphoric acid. Xylene was obtained as a byproduct.

Pitch coke and electrode carbon. - In addition to owning and operating two plants for production of pitch coke, one using ovens designed by Paul Hilgenstock and the other using the American Koppers system, which was said to be the preferred process, the A.G.K.V. sold almost all the electrode carbon produced in Germany from coal. They sold 139,745 tons of pitch coke, including fines, in 1943, and in 1944 it was planned to increase capacity to 175,000 tons per year but air raids prevented. The ash content ranged from 0.4 to 0.6 percent, and the selling price was 90 marks per ton. About 12,00 tons of Pott-Broche coke with an ash content of 0.1 percent was sold in 1944 and the price was 180 marks per ton. The question was asked, why does Pott-Broche coke with 0.1 percent ash bring twice the price that pitch coke havin 0.4 to 0.6 percent ash bring? The reply was that in wartime it was necessar to make a special high-quality aluminum as a substitute for copper, and coke made from the Pott-Broche coal extract permitted this. They doubted that th aluminum industry would pay as high a premium for extremely low-ash coke in peacetime. They also sold about 12,000 tons of coke prepared from coal

20/ Prepared from Combined Intelligence Objectives Subcommittee report "Fuel Research Activities, The A. G. der Kohlenwertsoff-Verbande Bochum," by H. H. Lowry and H. J. Rose, 1945 (?). (C.I.O.S. No. XXXI-29, P. B. 4324.)

Generated on 2024-09-19 18:51 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

cleaned by flotation at the Koenigin Elisabeth mine in 1944 and which had an ash content of 0.7 to 1.0 percent and sold at 125 marks per ton; the price wanted by the producer was 140 marks per ton, but this was not allowed. An unstated amount of coke prepared by acid-cleaning of coal at the Karl Alexander mine and which had an ash content of 0.8 to 1.2 percent ash, was also sold, though not by A.G.K.V., for electrode manufacture at a price of 80 to 90 marks per ton.

Solvent refining of coal tar. - They had studied, but only on a laboratory scale, the solvent refining of coal tar with benzene, aniline, furfural, acetone, methanol, etc.

Weather-resisting road tar (VFT Wetterteer) - It was reported that road tar in Germany was 50 percent derived from coal tar and 50 percent from asphalt, total sales amounted to about 300,000 tons per year, of which about 9,000 to 12,000 tons was a special weather-resisting tar having a melting point of 32° to 35° C., described in the following two paragraphs, which are a translation of a special report on this subject prepared by Dr. Giesselbrecht, the original of which is filed in Technical Oil Mission (T.O.M.) microfilm reel No. 70 (original designation No. 25B) near the end of the reel as 000895, item 1 (2 pages).

" The need which led to the development of Verkaufsvereinigung fur Teererzeugnisse (VFT), "weather-resisting" tar, was that of a practically unchangeable street-paving tar, which would be resistant to weather conditions prevailing in Germany. The changes which the tar naturally undergoes after incorporating into the road surface were to be effected in advance. This was to be achieved by subjecting the oil from which the tar was to be produced to a special preliminary oxidizing treatment. In practice the process is carried out by blowing air through normal anthracene oil at 160 degrees until the viscosity has reached about three Engler degrees at 50 degrees. The oil so obtained is then mixed with normal pitch of melting point 60 to 75 degrees (Krämer-Sarnow). A product is obtained that is less sensitive to moisture and exhibits smaller changes in use.

The weather-resisting tar contains at most 1 percent middle oils, 5 percent heavy oils, and absolutely no phenols or naphthalene. The free-carbon content is under 18 percent. The drip point is about 30 degrees Centigrade, the freezing point below 25 degrees Centigrade. Thus, the zone of plasticity extends over 55 degrees. The security against melting in heat and becoming brittle in the frost is greater than with a smaller span. The viscosity curve shows that the weather-resisting tar is still extremely viscous at 50 degrees Centigrade but has reached the thin liquid state of normal surface tar at 100 degrees Centigrade, and at 105 degrees Centigrade has the same degree of viscosity as the latter. The pitch content does not exceed 60 percent. At temperatures prevailing during the day, the weather-resisting tar is a semisolid mass. For this reason it is possible to

Generated on 2024-09-19 18:51 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

dispatch it in light corrugated-iron drums, so that irksome transport in barrels is not necessary. This tar is not used for preliminary treatment, only for surface treatment in hot weather. On account of its bitumen-like character, it is especially useful for use (1) in shady, dark places and (2) where there is much agricultural traffic, etc. It found its chief use in tar macadam coverings, where it has proved satisfactory. The production process has been patented by V. F. T.

Sulfuric acid from coal pyrites. - A special report was also prepared by Dr. Weller on the use of coal pyrites for sulfuric acid manufacture, the original of which is filed in Technical Oil Mission (T.O.M.) microfilm reel No. 70 (original designation No. 25B), item 2 (two pages), and of which the following is a translation:

The maximum amount of coal pyrites used by us was about 7,300 tons in 1942. The average moisture content was 3.9 percent, carbon 5.26 percent, and sulfur 41 percent. The sulfur and carbon contents vary widely, so that a large amount of coal pyrites must always be kept in store to avoid manufacturing difficulties caused by fluctuations in these contents. The minimum sulfur content is 35 percent, carbon maximum 8 percent, and water maximum 6 percent. The use of coal pyrites presented great difficulties in the beginning as a result of variations in sulfur and water contents. The coal pyrites were treated mainly in water-cooled Wedge furnaces and some in normal Lurgi L.C. 5.5 furnaces. Coal pyrites develop higher combustion temperatures than normal fine pyrites. The heat in the furnace must therefore be especially carefully controlled so that the purging gases are not so hot that the electro dust separator is damaged. The higher heat production in roasting coal pyrites makes repair work in the furnaces all the more difficult, especially the furnace rollers of the Wedge furnace. The interchange of the arms, too, is made very difficult as a result of the powerful heat radiation. The stirring arms and prongs are particularly powerfully attacked at the high temperature. Cast-iron prongs, which normally last up to 3 months with normal fine ore, were destroyed in 8 days by coal pyrites. For this reason, special prongs made of chromium alloy must be used, with additional expense. Despite mixing the individual grades of pyrites, the fluctuations of the grades are still considerable, and this has an adverse effect on the system following the roasting furnaces, on the through-put, and on the nitric-acid consumption. In the same way, the greater amount of gas produced by the combustion of the coal contained in the pyrites shows itself to be detrimental. It is not possible to obtain the same through-put of sulfur in the roasting furnaces when burning coal pyrites as with other grades of pyrites. The reason is the extraordinarily high heat output of the carbon in the coal pyrites. (The heat of combustion of the sulfur in pyrites can be fixed at about 2,000 cals., whereas

Generated on 2024-09-19 18:49 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

that of the carbon content is about 6,000. A 20-percent decrease in production has to be reckoned with in the production with pyrites from coal if additional furnace capacity cannot be installed. This decline in output results in an increased cost in production. The nitric acid consumption of the plant at the outlet side of the furnace must be fixed 25 percent higher than normal. The reasons for this are:

1. The dilution of the roasting gases by the CO_2 content, which results from the combustion of the carbon in the coal pyrites.

2. The contamination of the roasting gases by the products of distillation of the coal from the coal pyrites.

With coal pyrites, one has always to contend with an insufficiency of oxygen in the roasting gases, because the addition of air to the furnace must be limited to avoid too high a temperature in the upper stories (in den oberen Etagen) and in the outlet gases. The yield obtained corresponds to the sulfur content of the pyrites.

We had considerable difficulty in the operation of the tower cooling system connected to the outlet side caused by separation of sulfur in the condensers. After we had learned to control the difficulties presented in the use of coal pyrites, the result of roasting the coal pyrites was satisfactory at the prevailing prices, but it depended mainly on the possibility of utilizing the roasted ores, since the proceeds from selling roasted ore reduced the price paid for the sulfur in the pyrites. Experiments have been carried out on the treatment of pyrites by the addition of pyrites previously roasted to prevent excessive heating of the furnaces. Especially at the beginning this was the only way of mastering the difficulties, but of course it was very detrimental to the output. Experiments were later carried out on treating the coal pyrites mixed with Meggen pyrites. No particular success was achieved in this way. One of the great difficulties in this process was the utilization of the roasted ores, as the roasted ores of the coal pyrites, which are comparatively free from the impurities that disturb smelting, were then mixed with ore from the Meggen pyrites, which contains a large quantity of zinc.

Filtering Diesel fuel oils. - Dr. Weller also prepared a paragraph on filtering Diesel fuel oils, which was considered by A.G.K.V. to have novel features. The original German text is filed in Technical Oil Mission (T.O.M.) microfilm reel No. 70 (original designation No. 25B), item 4 (1 page), and the following is a translation:

The German army required that Diesel fuel oils have a certain filterability when determined in a specific apparatus

Generated on 2024-09-19 18:53 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

developed by the military authorities. In this apparatus a certain quantity of the fuel oil was cooled and forced through a standard filter medium by pressure, and the time required for passage of a determined volume was determined. Because of precipitation of paraffin, a series of fuel oils from the Fischer-Tropsch synthesis often failed to meet this requirement, although the pour point (Stockpunkt) was sufficiently low and lay considerably below the temperature at which the filterability was determined by the specifications. Other fuel oils, on the other hand, with a high paraffin content and a less favorable pour point showed a satisfactory filterability. It was suspected that those fuel oils that showed poor filterability did so because the paraffin in them precipitated out in an amorphous state and clogged the pores of the filter. This idea was shown to be correct by adding hard paraffin from the Fischer-Tropsch synthesis to the fuel oils to precipitate all the paraffins in a crystalline state. Only small quantities of the hard paraffin must be added to permit the Diesel fuel oils to meet the filterability test completely satisfactorily.

Interaction of sulfur compounds and lead tetraethyl. - The sulfur compounds in motor fuel derived from coal were said to cause precipitation of lead compounds in leaded gasolines, and this had to be avoided through refining with loss of fuel or by some other means. Dr. Weller prepared a special report on a method developed by A.G.K.V. for this purpose, the original of which is filed in Technical Oil Mission (T.O.M.) microfilm reel No. 70 (original designation No. 25B), item 3 (1 page), a translation of which follows:

During the African campaign, the German army used a mixture of benzine and benzene for motor fuel that was treated with tetraethyl lead. This motor fuel differed from those used in other theatres of war solely in the more stringent requirements for avoiding vapor lock. Chemically, the African fuel was identical with other motor fuels. It was shown that this motor fuel decomposed to such an extent that lead-sulfur compounds, among which lead sulfate was identified, precipitated. The disturbance was not so much the decrease in the anti-knock action of the lead tetraethyl as it was the formation of insoluble and hence inactive compounds of lead and sulfur. It was assumed that some sulfur compound was the source of trouble and preliminary experiments showed that carbon disulfide, which is present in small quantities in motor benzol, was the cause of the decomposition: Pure, sulfur-free hydrocarbons treated with lead tetraethyl showed the same phenomenon after addition of carbon disulfude. It was also demonstrated that the reaction was very sensitive to temperature, which explained why the decomposition did not occur in the theatres of war outside the tropics.

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

The trouble could be avoided either by complete removal of the carbon disulfide or by the addition of some unknown substance that would stop the reaction or retard it to such an extent that no harm would be done. It was found that additions in small amounts, especially of aminophenol, completely stopped the reaction. Other reducing compounds showed similar effects. At the same time, a test was developed for testing the behavior of motor fuels: The motor fuel was put in a glass pressure vessel in a drying oven at 110 degrees and the time was determined for the appearance of turbidity due to precipitation of compounds of lead and sulfur.

Gaseous motor fuels. - As distributors of motor fuel, A.G.K.V. were largely responsible for the supply of the following compressed gases:

1. Natural gas from Austria, Belgium, and the Netherlands.

2. Methane from coal mines in the Saar and elsewhere.

3. Town's gas from coke ovens.

4. Methanized town's gas.

The mechanization process was developed by Ruhrgas and Ruhrchemie for increasing the calorific value of coal gas and for decreasing its damaging effects upon pressure storage vessels. The process involves the use of a nickel catalyst for converting carbon monoxide and hydrogen to methane at 350 atmospheres pressure, but details were not known to A.G.K.V., who merely expected to operate the small plants at roadside filling stations. They had been building three of those plants.

Dr. Haver produced a drawing of a large plant, but he did not know whether this design had ever been used. This colored drawing is marked "DEMAG Permagas-Anlage Entwurf 3 Em 801696" and is reproduced in Technical Oil Mission (T.O.M.) microfilm reel No. 70 (original designation No. 25B), item 5, obtained during the investigation of the fuel-research activities of this company.

COAL CARBONIZATION RESEARCH OF CARL OTTO & CO., G.m.b.H., DAHLHAUSEN, ESSEN[21]

Conclusions

Facilities for testing coals to determine their suitability for coal carbonization were available, and evidence of considerable development work on new designs of ovens, particularly for low- and medium-temperature carbonization, was found.

21/ Prepared from Combined Intelligence Objectives Subcommittee report "Coal Carbonization Research of Carl Otto & Company, G.m.b.H., Dahlhausen, Essen," by H. H. Lowry and H. J. Rose, 1945. (C.I.O.S. Evaluation Report No. 366. Solid Fuels No. 17).

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Report of visit. - The chief of the laboratory, Dr. W. Oppelt, was not present, and it was reported that his present whereabouts were unknown, as he had not been seen for several months. His assistant, Dr. Münz, was present and claimed to have no first-hand experience with the coal-carbonization work. The figures given below may therefore be regarded only as approximate. The chemical laboratory appeared well-equipped for usual tests on coking coals, including expansion tests by the Bunte-Baum-Hauser method. The Micum drum test was the only one used for physical testing of coke.

Besides the chemical laboratory proper, which also served the refractory plant, separate installations of producer gas-heated coke ovens of various sizes were available in another part of the plant. Three experimental ovens were used for evaluating coals for new contract guarantees: One of 25 kilogram coal capacity, one of 50 kilogram capacity (200 millimeters wide and about 1 meter long and 60 centimeters high), and one of 100 kilogram capacity (400 millimeters wide and about 1 meter long and 60 centimeters high). With this equipment was a gas-heated rotating drum about 1 meter in diameter and 1.5 meter long for oxidation of strongly expanding coals to decrease the coking power of a part of the charge; the oxidized coal was blended with unoxidized coal to produce furnace coke. The process was said to give satisfactory results but was not known to have been used commercially, with the possible exception of a coke plant near Osnebruck, the name of which Dr. Münz did not remember.

Until recently, development work on oven design for low-temperature carbonization has been in progress. Current opinion was stated to be that LTC of bituminous coal was not economic except in special locations, as the Saar, where it might be used advantageously to produce a blending material for use with high-volatile coals for manufacture of blast-furnace coke, and except for production of fuel for mobile gas producers. Dr. Münz considered medium-temperature coke to be much better than low-temperature coke for house-heating purposes.

Low-temperature carbonization development has been carried on for many years. In 1934, an OTTO-LTC battery of three horizontal ovens of standard design but of smaller dimensions was built at Dahlhausen. The daily throughput amounted to several tons. This development was discontinued in 1937 or 1938, and the ovens were dismantled. Experiments were then begun on modification of their standard vertical oven as built for small gas plants. The principle chosen to increase the heat transfer was adding iron "double-T" inserts loosely in the vertical chamber, thus dividing the chamber of 1 meter width into cells about 5 to 6 centimeters wide. The total coal capacity of all cells in a chamber was 150 to 200 kilograms. This modification increased the coke capacity by 150 percent over that when the iron double-T's were not used and the vertical oven was used for standard high-temperature coke, in spite of the fact that a considerable fraction of the oven volume was occupied by the iron members. The coking time with flue temperature of 600° to 650°, using producer gas firing, was about 4 hours. From a 30-percent volatile coal, a 78-percent yield, based upon the dry coal, of coke containing 11 to 12 percent volatile matter was obtained as thin slabs, as the walls were somewhat movable and the charge from each cell was recovered almost as

Generated on 2024-09-19 18:55 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

a monolith. The yields per ton of dry coal of byproducts were stated to be: Tar, 7.5 percent; light oil, 0.8 percent; ammonia, 0.1 percent; and gas, 110 cubic meters. The gas had a gross heating value of 6,600 to 7,300 kcal per cubic meter (700 to 780 B.t.u. per cubic foot). This development was discontinued because of the failure of the iron inserts, which were said to be continuously decarburized. No drawings of this abandoned development were available. Most recent emphasis was on ovens for medium-temperature carbonization using chamotte wall construction. All work is at present at a standstill.

Generated on 2024-09-19 18:50 GMT / https://hdl.handle.net/2027/osu.32435030643829
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google

Digitized by Google

Original from
THE OHIO STATE UNIVERSITY